

THE TROPIC-BIRDS OCCURRING IN THE INDIAN OCEAN AND ADJACENT SEAS

BY

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(*With three plates*)

The tropic-birds form a small but interesting group of tropical sea birds. In general appearance and the manner of their flight they are not unlike large, heavily-built terns. They differ most markedly in the shape of the tail, which is cuneiform and in the adult has the centre pair of feathers much elongated. When fully developed these feathers are about as long as, or slightly longer than, the head and body of the bird together. When it is in the air they trail conspicuously but gracefully behind it, and provide a field character by which a normal adult of the group can always be recognised. The tropic-birds have short, weak legs, and can neither walk nor stand properly. They always rest with their bellies on the ground, and when moving forwards collapse on their breasts between each step. When frightened or otherwise in a hurry they help themselves along with the wings and bill, as some of the penguins do. A bird that is approached on its nest makes little attempt to escape, but remains, screaming harshly, and tries to defend itself with short, vicious stabs of its beak. The feet are webbed, and they swim well. Their bodies are compact, the neck short and the bill stout and pointed.

The moult of the two central tail feathers is abnormal in that they are not shed and replaced synchronously at the end of the breeding season. Specimens of the Redtailed Tropic-bird usually have one old, fully developed central feather, and one shorter new one, still partly in sheath at its base. The same arrangement may be found in the other two species, or these birds may have two growing feathers, of which one is much older and longer than the other. It seems probable that in the Redtailed bird one feather is lost at each annual moult and the new one takes about a year to grow to its full length. The other feather is then shed at the next general moult. Presumably the same alternation occurs in the whitetailed birds but here it is spaced less regularly, the old feather being dropped as soon as the new feather is full grown, without reference to the time of the annual moult. Dr. A. Wetmore (1914: 497) describes a somewhat similar condition in the Helmeted Hornbill, *Rhinoplax vigil* (Forst.). It is probable, as Chasen (1933: 73-4) suggests, that this system of alternate moulting occurs in some of the other birds which possess a single pair of elongated centre feathers, since it presents the only mechanism whereby there can always be at least one feather of full, or almost full, length.

With one exception, which is noted below, the adults are largely a lovely satiny white with a black crescent running across the eye and a black bar on the wing. The white of the neck and underparts may be suffused with a roseate or a golden yellow bloom, depending on the species, but the colour is fugitive and varies considerably in

intensity with the condition of the feathering. In the field the adults can be separated by the colouring of the bill and the form and colour of the elongated tail feathers. Juveniles lack the elongated centre tail feathers, and have the feathers of the upperparts and flanks marked with crescentic black bars. They cannot be distinguished specifically in the field, though no great difficulty should be experienced in identifying a bird in the hand.

As their name suggests, these birds are normally confined to the warmer seas and oceans. They are not very plentiful, but they are found on a number of small, isolated islands in or near the tropical zone all round the world. Murphy (1936, (2): 796) draws attention to an interesting point in regard to their distribution in the Atlantic and Pacific Oceans. The eastern sides of the great continental masses are washed by warm currents flowing out towards the poles, while the western sides have cool currents flowing in towards the equator. The spread of the warmer waters is therefore much wider in the western portions of these oceans than it is in the eastern. Similarly the known ranges of the tropic-birds there are more or less wedge-shaped. To some extent the picture is obscured by the fact that there are more suitable islands in or near the tropics in the western halves of the two areas than there are in the eastern. Nevertheless it is significant that in the Atlantic tropic-birds breed only from St. Helena (16°S. lat.) to the Cape Verde Islands (15-17°N. lat.) on the east side, stopping short of Tenerife, the Canaries and Madeira, while on the west they nest from the Abrolhos Islets (18°S. lat.) to the Bermudas (32°N. lat.). In the Pacific they occur only from the coast of Ecuador north to Panama in the east, while in the west they nest from the Kermadecs and Lord Howe (31°S. lat.) to the Bonin Islands (27°N. lat.). In the Indian Ocean the temperature spread is modified considerably by the great land mass of the continent of Asia which forms its northern boundary. The only cold inflow is along the southern portion of the west coast of Australia, turning west short of the north-west coastal region. Here on the east side of the ocean we find tropic-birds nesting in suitable localities from nearly 29°S. lat. on the latter coast north to (in all probability) the southern portion of the Bay of Bengal, while in the west they can only range from Réunion (21°S. lat.) to the Persian Gulf, just north of the Tropic of Cancer. Accordingly, though they still keep approximately within the area bounded by the 64° mean isotherm, they appear to be spread much more evenly over the Indian Ocean than over the Atlantic or Pacific.

The tropic-birds differ from the majority of the more conspicuous tropical sea birds in that some individuals at least normally leave the nesting grounds outside the breeding season and range widely over the open sea. Bennett (1860: 89) records several specimens of the Short-tailed Tropic-bird from a point almost midway between the Cape Verde Islands and the Bermudas, nearly 1,000 miles from the nearest land. The same species has also been seen about halfway between the Laccadives and Socotra, on the border of the Arabian Sea. On these occasions tropic-birds are usually met with singly or in pairs, and they show a peculiar interest in passing ships. They generally fly high above the water, and when they see a vessel turn

towards it and circle round several times, calling out harshly as they do so. Then, after a brief, raucous inspection they make off again. It would seem that they do not normally follow a boat for any length of time, and it is certainly most unusual for them to attempt to feed in the wake. Their short inspection is, however, generally sufficiently conspicuous for them to be noted and identified. In the Indian Ocean they are most likely to be encountered in the north-west corner, from about the region of the Maldives, Laccadives and Seychelles up towards the Arabian Sea.

The tropic-birds feed almost entirely on flying fish and squids. These are taken from near the surface of the sea by diving from the air. They usually drop down, with half-folded wings, from a height of about 20-60 feet. They make a considerable splash as they enter the water, but they return quickly to the surface. Often they seem to be back in the air again before the spray raised by their immersion has settled fully. The young birds are fed by regurgitation.

The tropic-birds lay only one egg to a clutch. The choice of nesting place, as shown below, varies considerably, but apparently in all cases they make use of a hole or a crevice, or select a spot where a bush or rock gives them partial shelter. They seem, in fact, to have a marked predilection for a protected or even an enclosed and confined site, in strong contrast to the great majority of the world's sea birds. A detailed account of one species, the Redtailed Tropic-bird, has already been given by the present writer in this journal (1949c: 230-33). Here one would merely stress an interesting point which seems to be common to the group. The youngsters are abandoned by their parents when they are fully grown. They then make for the open water alone, and do not normally return to the vicinity of the nesting grounds until they have acquired the complete adult plumage. In spite of this there are very few records of juvenile birds observed or taken at sea.

Three species are known:

The Short-tailed Tropic-bird, *Phaëthon æthereus* Linn.

The Long-tailed Tropic-bird, *Phaëthon lepturus* Daud.

The Redtailed Tropic-bird, *Phaëthon rubricauda* Bodd.

all of which are represented in the Indian Ocean. In the following notes an attempt is made to summarise what is known of the distribution of these birds in our area, with the inclusion of some unpublished data. Consideration is also given to the information available on breeding habits and seasons. In some respects the volume of published data is meagre. For this reason a brief statement of the essential characteristics of each species, as seen on the wing, has been added at the end of the section dealing with it.

Phaëthon aethereus Linn.: *Short-tailed Tropic-bird*.

Only one subspecies is found in our area, *P. æthereus indicus* Hume (type locality, the Mekran coast, Baluchistan).

This species has a restricted breeding range in the Indian Ocean. The race *indicus* apparently prefers small, isolated, fairly barren islands for its nesting sites. It is known principally from the Arabian Sea and adjacent waters, in parts of which it is not uncommon. The only other records from our area are old visual notes from the Bay

of Bengal and an immature bird taken by Cantor in the Strait of Malacca, all of which are seemingly based on strays. The only breeding site known outside our area is in the Paracel group in the South China Sea, about 165 miles from the coast of Annam (Delacour & Jabouille, 1931 (1): 31). In spite of the presence of this latter colony the only published record for Malaysian waters is Cantor's specimen mentioned above.

Holdsworth's visual records of *P. rubricauda* off the coast of Ceylon (1872: 482) must certainly be ascribed to this bird, this constitutes the southerly limit of its known spread in this region. Betts (1939: 386) reports two birds seen between the northern Laccadives and the mainland, also in February. He saw none during his stay in the archipelago, and it is of interest to note that there are apparently no records of any tropic-bird from islands in the Laccadive group. Hume (1876: 427 & 481) lists a specimen taken about 30 miles from the Cherbaniani atoll at the north end of the Laccadives in February. He also says that it is fairly common all up the west coast of India in a zone between about 7 and 30 miles of the shore. Further north Butler (1877: 285) reports three or four birds seen between the Gulf of Cutch and Karachi in March. Hume (1873: 147) says that he saw a number of birds off Ormara headland on the Mekran coast, of which he collected six ($\sigma \sigma$ 5, ♀ 1). Ticehurst (1923a: 461) also says that it is apparently fairly common at times off the coast of Sind and more particularly off the Mekran coast. Butler (1877: 302) mentions it from between Ormara and Gwadar in this area, and says that it is not uncommon up the Gulf of Oman. It would seem, in fact, that the Short-tailed Tropic-bird is fairly common in off-shore waters from the Gulf of Oman eastwards along the Mekran coast to Sind, and then, probably in decreasing numbers, southwards off the west coast of peninsular India to the northern limits of the Laccadives, or even as far as Ceylon. Few breeding sites are known from this region. Ticehurst *et al.* (1925: 725) say that it probably nests on the Great and Little Quoins, two rocky islets near the headland of Oman, but no eggs or fledglings appear to have been found there. Seemingly the only authentic specimens taken so far have come from the little island of Nabi-u-Tanb, at the eastern end of the Persian Gulf. It lies 7 miles south-west of the lighthouse island of Tanb, and is described as one mile long and three-quarters of a mile broad, with a rocky hill 116 feet high; it is said to be barren, uninhabited and without water. Young and old birds and a year-old egg were taken in the first week of April, 1921, and a single egg, almost ready to hatch, on 24 March 1923 (Ticehurst *et al.*, 1925: 729-30).¹

There do not appear to be any definite records for the Hadramaut coast of Arabia, but this bird is fairly well known, and several breed-

¹ In addition to these two eggs Ticehurst *et al.* refer to another egg in the Cox-Cheesman collection taken on Nabi-u-Tanb on 23 April 1923, and Stuart Baker (1929: 291) to an egg taken by Major Pitman from a crevice on an unspecified barren island in the Persian Gulf in April 1916, and one collected from the same neighbourhood by Irvine in 1898. In none of these cases was the parent bird identified, but it seems almost certain, as Stuart Baker says, that it was *P.a. indicus*.

ing grounds have been located in the Gulf of Aden, at the southern end of the Red Sea and off the Somali coast. North (1946: 490-1) found two nests with young birds almost ready to fly on Mait Island, in the Gulf of Aden, at the end of November. Jones (1946: 228-31) discovered birds breeding on the Geziret Saba, in the Bab-el-Mandeb Straits, about 9 miles south of Perim, in August. Von Heuglin (quoted in North *loc. cit.*) says that it breeds (?lays) in the Dahlak Archipelago, in the Red Sea off Massawa, in June and July. Bulman (1944: 480-92) makes no mention of this species in his account of the birds of Safaga, a small island further up the Red Sea and only 235 miles south of Suez. Archer and Godman (1937 (1): 19-20) say that it may be found as far north as Tor on the Sinai peninsula, but it seems that the Dahlak Archipelago is the most northerly recorded breeding ground in this area. These authors also say that the Short-tailed Tropic-bird is known from Danakil Bay, about Jebel Saqur and Annan, about Bab-el-Mandeb, on Bur da Rebschi, and about Sokotra and Guardafui. I have myself twice seen solitary adults at sea in the latter region, once about 10 miles north of Sokotra, in September, and the other about halfway between Aden and Sokotra, in February.

The records from the Bay of Bengal are less satisfactory, and no direct evidence has yet been brought forward of breeding in this area. Baker (1929: 291) makes no reference to its occurrence here, and Peters (1931: 78) gives its range only as the northern Indian Ocean, said to breed on islands in the Persian Gulf and the Dahlak Islands. Hume (1874: 323) says that he had been told that this bird was often seen on passages to and from the Andaman Islands, especially in the neighbourhood of the Cocos Islands (north of the Andamans proper), but he did not encounter it himself on his visit to the group. He also mentions four birds which Davison is said to have met with in the Bay of Bengal in lat. 9°N. (Hume, 1877: 303). Later Hume and Davison (1878: 493) say that Davison met with this species almost opposite the southernmost point of Tenasserim and again off Cape Negrais. Are these the birds to which Hume referred in his earlier paper? It is possible that they are. It is certainly significant that there are no later records and no other citations of *P.a. indicus* from this region. The birds may have been strays from the Paracel colony, or they may possibly have been immature birds of one of the other species.

There is one formal record for the Strait of Malacca; the last reference to the occurrence of these birds in our area. It is an example taken by Cantor, and now in the British Museum. It is usually assumed to have been obtained near Penang, but there is no indication of this in the earlier publications of the record. Sharpe and Ogilvie-Grant (1898: 459) list the bird as an adult, but J. D. Macdonald (*in litt.*) tells me that it is an immature bird, and therefore one of the few records of an immature bird taken at sea. On the evidence available at present it must be assumed to be a stray from the Paracel colony. Pulau Perak, a barren outcrop about 70 miles west of Penang Island, is a likely nesting place for this species, but a search of the island early in April showed no indication of tropic-birds breeding there (see Gibson-Hill, 1950).

It is of interest to note, as mentioned above, that *indicus* apparently prefers barren or relatively barren islands as breeding sites. This point is significant in relation to the only two parts of the Indian Ocean where it is not uncommon, and is known to be nesting—the eastern end of the Persian Gulf and along the Mekran coast to Sind, and the region round the south end of the Red Sea and the Gulf of Aden. At all the recorded sites the birds appear to have been making use of crevices or fissures in bare rock faces or among boulders. In addition only a few birds have been found at each place. von Heuglin writes of small and thinly populated colonies, with the nests themselves in narrow deep clefts in the rock, in fissures, or under large loose boulders. The entrances to these crannies are often so narrow and low that it seemed that the bird itself would hardly have room to pass. Here the female lays a single egg on the bare soil, on blown sand, or on the bare rock. The holes I investigated extended inwards for three or four feet, and the actual nesting-site was generally behind a projecting angle of the rock so that it could not possibly be seen from the outside . . .’ (quoted in Archer & Godman, 1937 (1): 21-22). Ticehurst *et al.* (*loc. cit.*) say that there is a little scrub on Nabi-u-Tanb but no trees; ‘at the base of the sea cliffs are many water-worn fissures, mere cracks at the top and eight inches to two feet wide at the base and going in some six feet, some ending in an enlarged chamber; it was in these fissures that the Tropic Birds were breeding.’ North (*loc. cit.*) says that Mait Island is completely devoid of vegetation, and has no fresh water except after rain. He found one nest in a crevice under a boulder and a second in a hole in a cliff-face. Jones (*loc. cit.*) gives a rather similar account of two nests from Geziret Saba.

The Short-tailed Tropic-bird is midway in size between the other two species, but with the elongated centre tail feathers appreciably shorter. Baker (1929: 291-3) gives the following measurements in mm. for adult birds:

—	Wing flat	Exposed culmen	Tarsus	Central tail. Longest feather
<i>P. a. indicus</i> ...	281-301	55-60	25-28	215-301
<i>P. l. lepturus</i> ...	252-282	44-51	21-23	{ to 575, av. c. 450
<i>P. r. rubricauda</i> ...	330-339	65-69	30-33	360-428

In the Indian Ocean the adult can always be identified by the combination of white centre tail feathers and a red or orange-red bill. The races of the Longtailed Tropic-bird occurring here have a yellow or yellowish bill at all times, while in the Redtailed Tropic-bird the elongated centre tail feathers have black shafts and thin, attenuated red vanes. In addition the upper parts in the present bird are narrowly barred with black, an instance of the retention of a juvenile characteristic. Too much reliance should not be placed on this feature in the field here, however, as it brings in the possibility of a

late immature example of one of the other two species being taken for the Short-tailed Tropic-bird. The immature bird resembles the adult except that the centre tail feathers are not appreciably longer than those on either side of them, the bill is yellowish not red and the markings on the dorsal surface are broader; on the head they almost form a black occipital crescent. The immature bird can scarcely be differentiated from the young of the other two species in the field. In the hand first juvenile birds can be separated on the following points, in addition to differences of size (as above) and the colouring of the soft parts. The descriptions of the markings should be taken as general indications of the patterns. There are apparently minor individual variations, even between birds of the same age, and probably small subspecific differences, but these are not sufficient to confuse the diagnosis.

—	<i>P. a. indicus</i> ¹	<i>P. lepturus</i>	<i>P. rubricauda</i>
Outer primaries.	Black, with a broad white border to the inner web.	Shaft and outer web black; tip and inner web white.	White, with a narrow black shaft-stripe broadening at the tip.
Inner primaries.	White with very dark gray shaft-stripe.	White with shaft black.	White, with black shaft and sub-apical spot.
Outer secondaries.	White, with shaft blackish.	White, with base of shaft black.	White, with shaft black.
Inner secondaries.	Dark grey bordered with white.	White with black half crescents on outer web.	Black, with irregular white border.
Rectrices ...	7 pairs. White, centre pair with black tips.	6 pairs. White, with black shafts and sometimes sub-apical spots.	8 pairs. White, with black shafts and small sub-apical spots.

Phaëthon lepturus Daud.: *Longtailed Tropic-bird*.

Two races of this bird are known from our area. The typical race (type locality, Mauritius) which occurs in suitable localities over the greater part of it, and the Golden Longtailed Tropic-bird, *P. lepturus fulvus* Brandt (type locality, Christmas Island) which is known only from the neighbourhood of Christmas Island, 180 miles south of Java Head.

The typical race of the Longtailed Tropic-bird breeds at a number of places in the Indian Ocean near or south of the equator. It is usually found on oceanic islands with a fairly thick cover of trees or palms, and is not known authentically from the hotter and more barren localities round the Red Sea, the Persian Gulf and the Mekran

¹ Not examined. Data from Ticehurst (1923b: 71) and Baker (1929: 291). *P. lepturus* based on *P. l. fulvus* (Christmas I.). *P. rubricauda* on *P. r. westralis* (Christmas I.).

coast.¹ In the western part of the Indian Ocean it nests in some numbers in the Mascarene, Seychelle and Maldive groups and is fairly common in their neighbourhood. Legge (1880 (2): 1174) mentions a dead bird picked up on the Galle face, on the Ceylon coast, in 1870. There is also a record of a bird killed on Ross Island in the Andamans (Hume, 1874: 323), of one taken on the south coast of Pegu, near the mouth of the Bassein estuary (Oates, 1883: 225), and of a straggler collected from the Barak River, near Dilkushah in north-east Cachar, about 170 miles from the sea (Hume, 1888-9: 351). Although this bird is always said to occur in the Andamans² these records, which are almost certainly attributable to strays, are the only authentic formal records for the northern Indian Ocean outside the Maldive area. The only established nesting grounds outside the Mascarene—Seychelles—Maldive region are the Cocos-Keeling Islands, where there is a small colony which comprised about 10-15 pairs in 1941 (Gibson-Hill, 1949b: 230), and Diego Garcia (Chagos) where Gardiner found a single pair in 1905 (1907: 110). The typical race, *P.l. lepturus*, is not known from localities outside the Indian Ocean.

In the Mascarene islands this bird is known to breed on Mauritius and Rodriguez (Baker, 1929: 293). It almost certainly formerly bred on Réunion, and may still be present there; the British Museum collection contains several skins from this locality (Sharpe & Ogilvie-Grant, 1898: 455). Vesey-Fitzgerald (1941: 530) says that this bird is common around all the rocky islands of the Seychelles Archipelago, and apparently nesting widely. Betts (1940: 502) says that

¹ Stuart Baker (1929: 293) gives the distribution of this bird as the 'Red Sea and Persian Gulf, over the whole of the Indian Ocean', but the first part of this statement cannot be accepted. There are no authentic records of *lepturus* from the northern part of the Arabian Sea and adjacent waters. Hume (1876: 481-2) writing of *indicus* says 'This is the only species of *Phaethon* that I have seen or known to occur in the Indian Ocean anywhere near our Indian coasts or in the Gulf of Oman, or the Persian Gulf. Both *flaviostris* (= *lepturus*) and *rubricauda* have, I know, occurred in the Bay of Bengal and about the Andamans and Nicobars, but I have neither seen nor heard of either of these in the localities above alluded to.' This still holds good. Archer & Godman (1937 (1): 20) say that *lepturus* might at any time find its way into the Gulf of Aden 'and any definite record of its occurrence in the Gulf of Aden or the Red Sea would be of the utmost interest.' Personally I think it most unlikely that a true *lepturus* would get into these warmer regions, but I agree fully that a definite record of its occurrence would be of the utmost interest. All the supposed records that I have been able to trace are of the quality of those of Major Phillips, who nearly saw five of the four storm petrels authentically known from the northern Indian Ocean in one voyage from Suez to Karachi! He gives several records of *P. l. lepturus* from the southern end of the Red Sea, including '15-45 Hours. Tropic bird, with red-bill and long white tail feathers flew close across our bows, giving an excellent view—definitely the White Tropic Bird (*P. l. lepturus*); a beautiful bird.' (Phillips, 1947: 608). A red bill and long white tail feathers: definitely *P. aethereus indicus*, a very beautiful bird!

² Accepting general statements such as those of Hume (1876: 481) and Smythies (1940: 445), together with Kloss's inclusion of this bird in his list of the avifauna of the Andamans (1903: 330), I have myself helped to perpetuate the error, and in a note in my Checklist of the birds of Malaya (1949d: 16) I give the Andaman Islands as a breeding ground of *P. l. lepturus*. Now, on a fuller examination of the records from the Bay of Bengal, I am satisfied that there is not yet any evidence that it actually nests in this region.



An adult of the Long-tailed Tropic-bird—*Phaeton l. lepturus*, in flight, taken at sea 200 miles east of the Cocos-Keeling Islands.



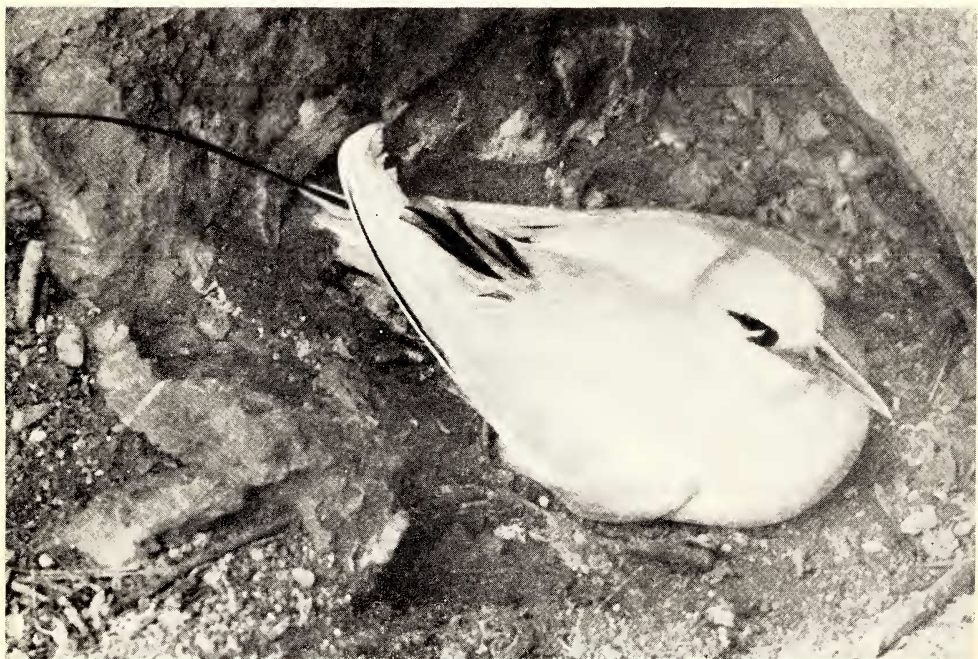
Photos

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An adult of the Christmas Island Long-tailed Tropic-bird—*P. lepturus fulvus*, in flight.



An adult of the Red-tailed Tropic-bird—*P. rubricauda westralis*, in flight.



Photos

C. A. Gibson-Hill

A Red-tailed Tropic-bird—*P. rubricauda westralis*, on its nest in a rock crevice on Christmas Island (Indian Ocean).

it nests in small numbers on Mahé, in this group, and that there were over 1,000 pairs breeding on Aride at the time of his visit to the island (25 April to 8 May). Vesey-Fitzgerald also reports its presence in the Aldabra-Providence-Farquhar groups, south-west of the Seychelles. Gardiner (1903 (1): 369) says that he saw it on nearly every atoll in the Maldives, including Addu, and found it nesting at Hebaridu in South Mahlosmadulu atoll. He also found a single pair nesting on Diego Garcia, in the Chagos group; they were stated to have bred for a number of years in a large *Pisonia* tree (1907: 110). It cannot be common there; Bourne (in Saunders, 1886: 335) refers to frigate-birds and boobies on Diego Garcia, but he did not apparently see any tropic-birds. I cannot trace any record for the Laccadive Islands; Betts (1939: 386) does not list it.

The nesting site varies. Vesey-Fitzgerald (*loc. cit.*) says that on the larger islands of the Seychelles, such as Mahé, Silhouette and Praslin, this bird nests in hollow trees high up in the mountain forests, while on the smaller islands, such as Cousine, Frigate and Aride, it nests in holes in the ground and under overhanging rocks. The latter sites are confirmed by Betts who says that on Aride the egg is normally laid on the bare ground in a dark and sheltered spot in a rock crevice or under a boulder, often at a considerable depth and concealed by long grass. In the Maldivian Archipelago Gardiner (*loc. cit.*) found three nests in a hollowed-out branch of a Tulip Tree, *Hernandea peltata*, and his collector two others in a neighbouring tree. Vesey-Fitzgerald does not give any breeding dates. Betts found mostly eggs and very young birds on Aride at the end of April. Gardiner's nests were located on 24 November; one contained an egg and three had single nestlings. I found two nests on the Cocos-Keeling Islands, one in May and the second in June, each contained a single egg. They were situated on the ground, among coconut palms, and partly in the shelter of scrubby bushes.

The Golden Longtailed Tropic-bird, *P. l. fulvus*, the other race occurring in the Indian Ocean, is known to nest only on Christmas Island where there were about 300-450 breeding pairs in 1938-40 (Gibson-Hill, 1947b: 95 & 143-6). It has been observed over open water as far north as Java Head, and it is said to stray occasionally to the edge of the Cocos-Keeling group, about 530 miles west of Christmas Island. It has not been reported outside these limits. Apparently it nests only in cavities in the trunks of dead or dying trees, usually at a height of 25-50 feet from the ground. A favourite place is a hollow that has rotted inwards where a main branch has fallen away. This site is very similar to the ones recorded for the typical race by Gardiner, and some of those noted in the Seychelles by Vesey-Fitzgerald. It is possible that a few individuals breed in each month of the year, but from notes made by the present writer on Christmas Island it seems that the majority of the eggs are laid between June and October.

The adult Longtailed Tropic-bird can be identified by its very long, white tail feathers and (in the Indian Ocean) yellow, greenish yellow or yellowish grey bill. Some birds have a lovely but fugitive

golden apricot blush on the feathers of the breast, belly and back, but this is scarcely discernible when they are in flight. The Golden race from Christmas Island is most distinctive, and cannot be confused with any other bird. The areas normally white in an adult *Phaëthon*, including the elongated centre tail feathers, are here a rich apricot yellow, seeming, when the bird is seen sunlit in new plumage against a deep blue sky, as though they were burnished gold. Apart from this conspicuous distinction there appears to be little difference between the two races. The soft part colours are almost the same and, as the following measurements show, there is no significant variation in size.¹

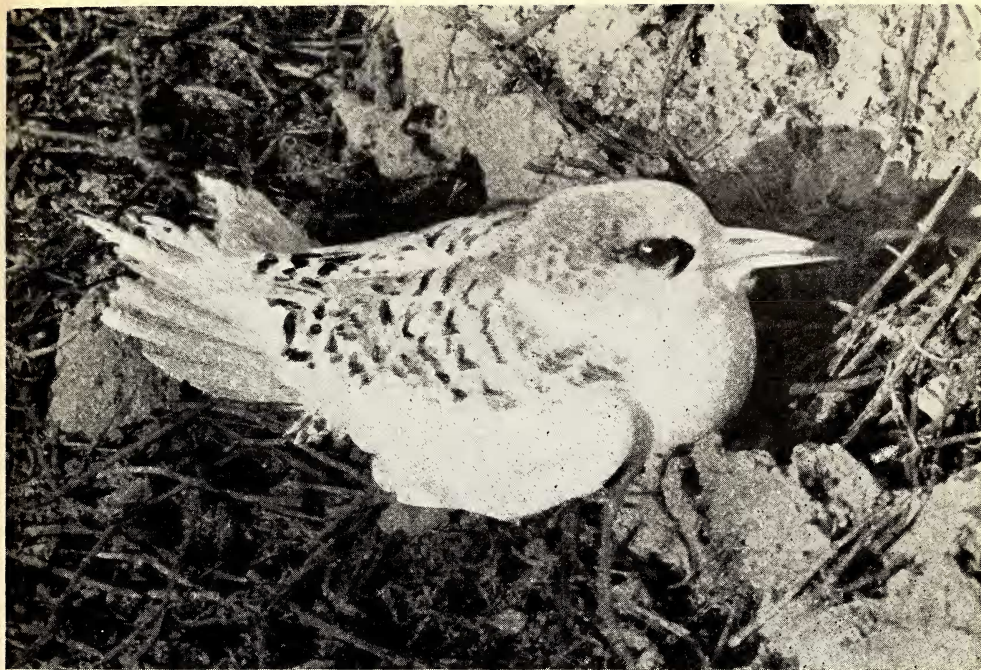
Coll. No.	Date taken	Sex	Total length	Tail	Wing flat	Tarsus	Exposed culmen	Bill to gape
<i>P. lepturus lepturus</i> (Cocos-Keeling Islands).								
V12	13 : 3 : 41	♂	651	355	277	25	51	76
V13	26 : 2 : 41	♂	678	405	274	23	48	67
V15	23 : 2 : 41	♂	772	474	155+	23	49	72
V16	30 : 1 : 41	♂	707	416	279	23	50	72
V17	2 : 10 : 41	♂	636	334	274	24	50	74
V18	2 : 10 : 41	♂	640	356	281	24	50	73.5
V19	17 : 10 : 41	♂	790	501	273	23	48	72
V14	26 : 2 : 41	♀	775	482	276	24	50	68
<i>P. lepturus fulvus</i> (Christmas Island).								
D38	6 : 12 : 40	♀	726	415	280	23	49	72
D39	6 : 12 : 40	♀	810	524	285	23	51	72
D36	12 : 11 : 40	♀	744	440	287	25	52	74.5
D37	21 : 11 : 40	♀	739	451	279	23	50	69

Phaëthon rubricauda Bodd. : Redtailed Tropic-bird.

Two races of this bird are known from our area. The typical race (type locality, Mauritius) which occurs in and near the Mascarene Islands, and the Western Australian race, *P. rubricauda westralis* Math. (type locality, Houtman's Abrolhos, West Australia), which is found in the eastern portion of the Indian Ocean and in the Banda Sea.

The typical race of the Redtailed Tropic-bird is not numerous and has a very restricted range. It breeds on Round Island, near Mauritius (but not on Mauritius itself), and on Assumption Island (Baker, 1929: 293), and on the Cosmoledo atoll and the southern island of the Aldabra group (Vesey-Fitzgerald, 1941: 530). There are no recent accounts of its status in the Mascarene group. From Vesey-Fitzgerald's account, and that of Betts (1940: 530), it certainly does not appear to be plentiful in the Aldabra area. It is known from open water in both these neighbourhoods, but there are no authentic records of it from much further afield and no specimens have been

¹ Measurements, in mm., in the flesh of specimens taken by the present writer on Christmas and the Cocos-Keeling Islands (1940-41). The tail is measured from the base of the longest rectrice, the exposed culmen from the tip of the bill to the beginning of the feather tract.



A juvenile of the Christmas Island race of the Long-tailed Tropic-bird—*P. lepturus fulvus*.



Photos

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A juvenile of the Red-tailed Tropic-bird—*P. rubricauda westralis*, photographed two or three days before leaving its nest.

